Evaluation of Variable Message Signs in Wisconsin: Driver Survey

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16. Abstract

The ITS Program at the University of Wisconsin at Madison conducted a survey for the purpose of assessing drivers' opinions on travel conditions in Wisconsin, investigating the extent of drivers' knowledge regarding general freeway issues, and determining user awareness and perception of Variable Message Signs (VMS) and ramp meter. With the survey results, major perceptions regarding general transportation services, VMS and ramp meter are summarized as follows.

1. Prompt emergency responses and reducing traffic congestion are considered as important needs.
2. Maintaining ride quality (comfort) and overall pavement condition of the freeways is desired.
3. Users are willing to change time of trips to avoid or minimize congestion.
4. Users feel that speed limits are not obeyed and stricter laws need to be enforced.
5. Drivers are quite familiar with both VMS and ramp meters.
6. Variable message signs are useful to report weather and traffic conditions. However, more updated messages would be helpful for the drivers.
7. Ramp meters have been effective in controlling congestion.

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Table of Contents

Executive Summary

The ITS Program at the University of Wisconsin at Madison conducted a survey for the purpose of assessing drivers' opinions on travel conditions in Wisconsin, investigating the extent of drivers' knowledge regarding general freeway issues, and determining user awareness and perception of Variable Message Signs (VMS) and ramp meter.

During December 2001, a total of 500 survey sheets were sent out to drivers residing in 22 selected counties in Wisconsin in a completely random manner. In order to focus on VMS and ramp meter users, the counties along major Wisconsin freeways (I-39, I-43, I-90, and I-94) were selected. These counties include Brown, Columbia, Dane, Dunn, Eau Claire, Jefferson, Juneau, Kenosha, La Crosse, Manitowoc, Marathon, Milwaukee, Monroe, Ozaukee, Portage, Racine, Rock, and Sauk. (See Appendices I and II for details.) Then, a random sampling was performed. As of December 31st, 2001, 221 completed survey forms were returned and used for analysis. After excluding bad addresses, a response rate of 51.6 percent was calculated.

With the survey results, perceptions on both traditional transportation aspects and ITS related aspects could be investigated and analyzed. Specifically, major perceptions regarding general transportation services, VMS and ramp meter are summarized as follows.

8. **Prompt emergency responses and reducing traffic congestion are considered as important needs.**

9. **Maintaining ride quality (comfort) and overall pavement condition of the freeways is desired.**

10. **Users are willing to change time of trips to avoid or minimize congestion.** The majority of the users stated that it would have little or no inconvenience to leave 20 minutes earlier or later for shopping or recreational purposes. However, leaving 20

minutes later from home to work or 20 minutes earlier from work to home would not be practical for the majority. Approximately 82 percent of drivers would change time of trips if there were a lot more congestion in their area. If there were no congestion in the area, 41.8 percent of drivers would drive more. Although 9.7 percent oppose variable speed limits, 47 percent favor it.

11. **Users feel that speed limits are not obeyed and stricter laws need to be enforced.** Overall, users seem to be satisfied with the Wisconsin freeways, although there are some concerns for many urban areas where traffic becomes congested during peak hours. In addition, users stated that more lanes need to be constructed and reflective pavement markings are sometimes difficult to see.

12. **Drivers are quite familiar with both VMS and ramp meters.** Their attitude toward the deployment of VMS and ramp meter is positive. Drivers have identified more desired features regarding VMS, including the alternate route information display and the avoidance of the sign blockage.

13. **Variable message signs are useful to report weather and traffic conditions. However, more updated messages would be helpful for the drivers.** Forty percent of Wisconsin drivers are familiar with VMS and 69.6 percent have VMS on their regular travel routes. Users stated that VMS improves freeway safety, saves driving time and improves travel information. There were mixed feelings on how VMS would reduce the stress caused by driving. The majority of the users said the information on VMS is somewhat reliable. An alternate route would be chosen if the VMS indicated an increase of travel time of more than 15 minutes and the delay is due to a crash, construction, or traffic congestion. The major reason why a driver would not adjust their travel route is that they are not sure the alternate route would be faster. A major concern with permanent and portable VMS is that the users' view of the sign is blocked by other traffic.

14. **Ramp meters have been effective in controlling congestion.** Exactly half (50%) of

the users from this survey have ramp meters on the routes they frequently travel on. The average length of a trip involving a ramp meter was approximately 25 minutes. Drivers who are aware of alternate routes, which can avoid ramp meters, would only use the alternate route if the ramp was completely full or overflowing with waiting vehicles.

Traffic congestion is a great concern in Southeastern Wisconsin and is becoming a major concern along major freeways in Wisconsin. Motorists need more accurate travel information to help them make better decisions on departure times and routes. For instance, according to the survey results, more diverse traffic information regarding alternate route should be provided via VMS in the near future. Motorists even want this type of information no matter whether the alternative route is faster or not.

To meet such needs, the development of more message contents is desired. In other words, more appropriate message contents for each traffic condition should be prepared according to national standards. This would require the inter-agency coordination and consensus on the message deployment, standard message formats, and abbreviations. In addition, some uniform field installation guidelines should also be prepared, which provide information on the following:

- a general Wisconsin VMS installation guideline
- site selection and roadway factors
    - local installation of permanent VMS
    - VMS visibility
    - VMS technology
- communications and other traffic factors
    - portable VMS placement
    - special considerations

Introduction

The University of Wisconsin – ITS (Intelligent Transportation Systems) Program, within the Department of Civil and Environmental Engineering, developed a 39 question Wisconsin Driver Survey questionnaire for the year 2001. The purpose of the survey was to: 1) assess drivers' opinions on travel conditions in Wisconsin, 2) investigate the extent of drivers' knowledge regarding general freeway issues, and 3) determine user awareness and perception of the various incident management programs.

The general areas of research included in the survey were as follows:

- General Perceptions About Driving and Transportation Services in Wisconsin
- Knowledge and Perceptions of Variable Message Signs (VMS) and its benefits
- Knowledge and Perceptions of Ramp Meters and its potential benefits
- Perceptions of Freeway Travel in Wisconsin
- Demographic Characteristics of Drivers

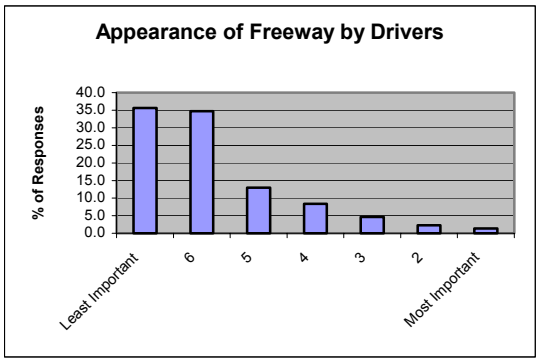
During the month of December 2001, a total of 500 survey sheets were sent out to drivers residing in 22 selected counties in Wisconsin in a completely random manner. The counties were selected if a major Wisconsin freeway, such as I-39, I-43, I-90, and I-94, affects them in a transportation sense. These counties included Brown, Columbia, Dane, Dunn, Eau Claire, Jefferson, Juneau, Kenosha, La Crosse, Manitowoc, Marathon, Milwaukee, Monroe, Ozaukee, Portage, Racine, Rock, and Sauk. (See Appendix I and II) Then, a random sampling was performed. As of December 31st, 221 completed survey forms were returned, and then used for analysis. Seventy-two surveys were mailed back to the ITS Research Group "Return To Sender," indicating a change of address. These "unopened" surveys were subtracted from the original total. As a result, a response rate of approximately 51.6 percent was calculated.

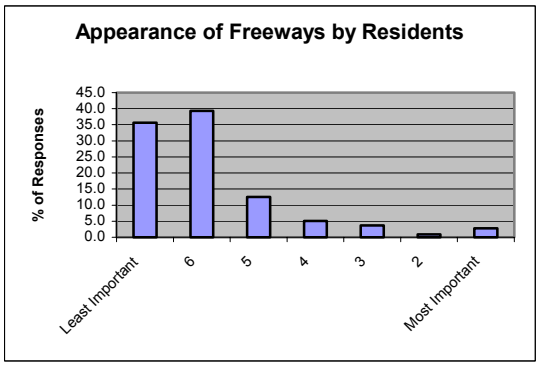
In order to encourage the Wisconsin residents to complete and mail in their surveys, two 34-cent stamps were enclosed within the envelopes containing the questionnaires along with a letter explaining the intent of the survey and its importance to Wisconsin drivers. In addition, a book of 10 additional 34-cent stamps was promised to participants who completed and mailed back their surveys by December 28, 2001. An identification number was printed on the back of each survey booklet to ensure confidentiality and allow the ITS Research Group to keep track of those whom were eligible for receiving stamps.

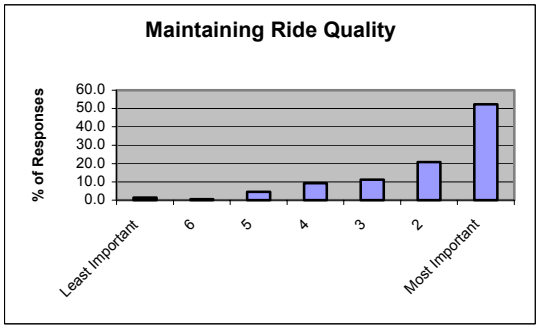
Ultimately, the survey achieved its stated aim of obtaining important motorist feedback regarding their awareness and perception of various transportation programs. This information will be used to achieve the overarching goals of 1) improving the various incident management programs implemented in parts of Wisconsin, such as Variable Message Signs 2) improving the effectiveness of traffic management programs and procedures, such as Ramp Meters, and 3) improving the quality and availability of traveler information. The final results of the survey have been calculated and will be used to help achieve these goals.

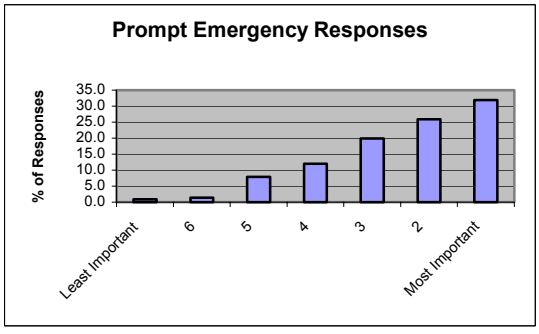
General Perceptions About Driving and Transportation Services in Wisconsin

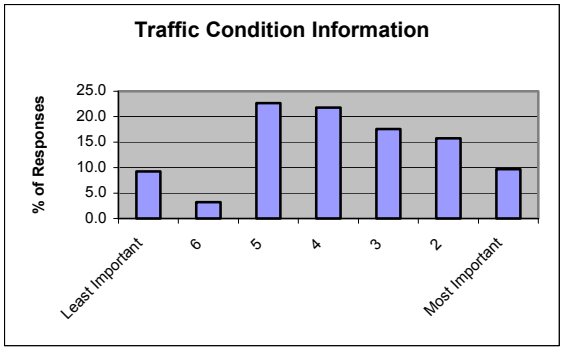
1. The following are characteristics of freeway facilities. Please rank them in the order of importance to you. Use 1 for the most important, and 7 for the least important.
    a. Improving the appearance of the freeway as seen by drivers (landscaping, columns, retaining walls, etc.)
    b. Improving the appearance of the freeway as seen by people who live or work near the road (landscaping, columns, retaining walls, etc.)
    c. Maintaining ride quality and overall pavement condition
    d. Prompt response to crashes and disabled vehicles by the emergency services
    e. Providing information on traffic conditions through radio, electronic signs, etc.
    f. Eliminating unusual situations such as left-side entrance ramps, exit-only lanes, etc.
    g. Reducing traffic congestion

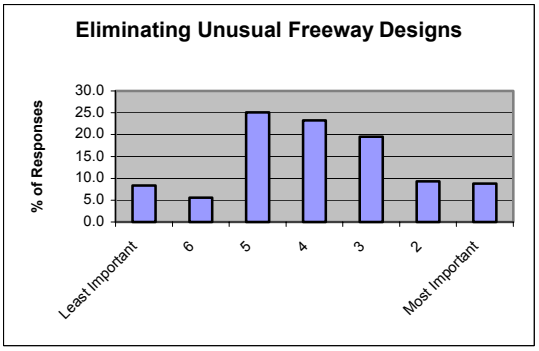


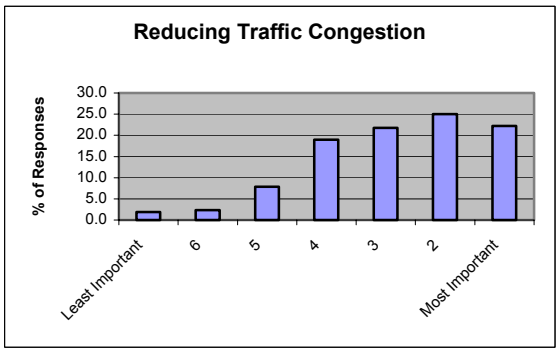






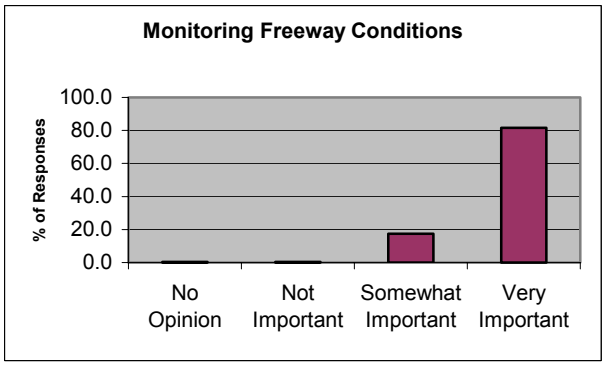






2. In your opinion, in larger Wisconsin cities how important is it to monitor freeway traffic conditions, report crashes and other problems to the emergency services, and notify the public about freeway travel conditions such as congestion, icy pavement, and construction delays?

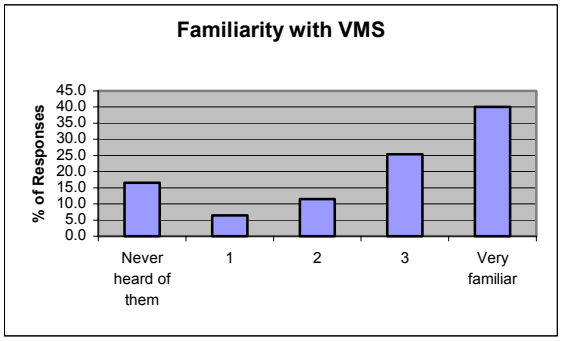
___very important ___somewhat important ___not important ___no opinion



Total Response: 217

3. Are you familiar with what variable message signs are?

Never heard of them	←			→ Very familiar
0	1	2	3	4



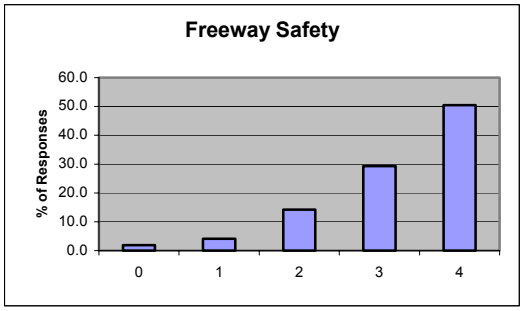
Total Response: 217

Knowledge and Perception of Variable Message Signs

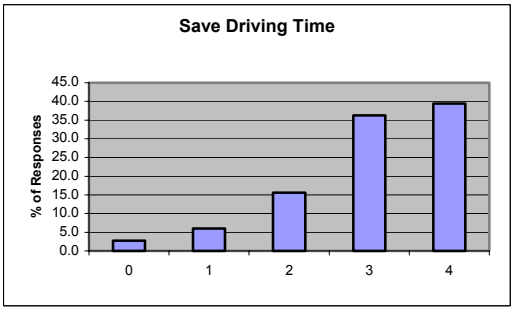
(After reading a description)

4. Now that you know a little bit about Variable Message Signs, please describe your reactions to them by circling the number that represents your feelings for each line:

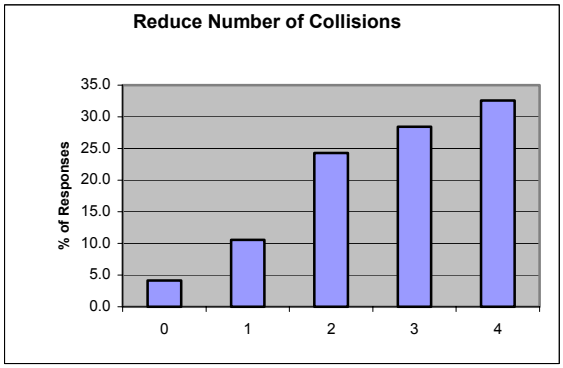
Will do nothing for freeway safety	0 1 2 3 4	Will improve freeway safety
Will not help me save driving time	0 1 2 3 4	Will help me save driving time
Will do nothing to reduce the number of collisions	0 1 2 3 4	Will reduce the number of collisions
Will do nothing to improve travel information	0 1 2 3 4	Will improve travel information
Will do nothing to reduce stress caused by driving	0 1 2 3 4	Will reduce stress caused by driving



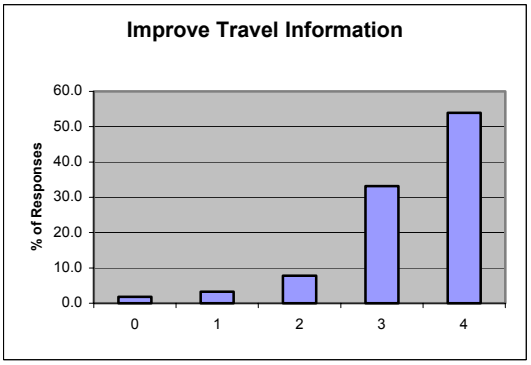
Total Response (a): 218



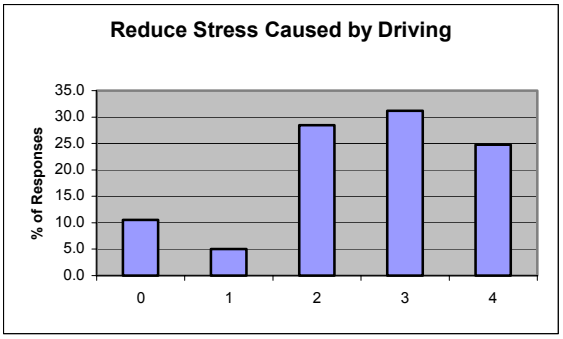
Total Response (b): 218



Total Response (c): 218



Total Response (d): 217



Total Response (e): 218

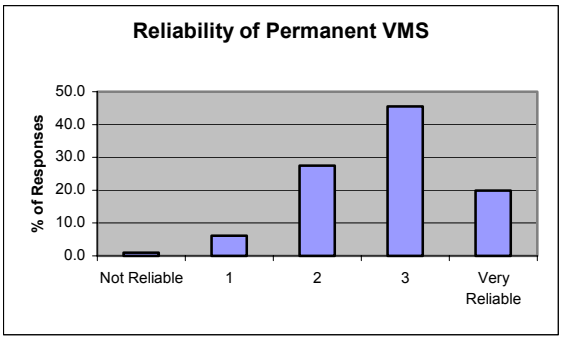
5. Are there variable message signs on any of the routes you travel most frequently?

No
Yes
Not sure

Response Number:	217
Response Rate (%):	98.2
Number No:	62
% No:	28.6
Number Yes:	151
% Yes:	69.6
Number Not Sure:	4
% Not Sure:	1.8

6. Do you feel that the travel time information provided on permanent variable message signs is **reliable** (please circle a number)?

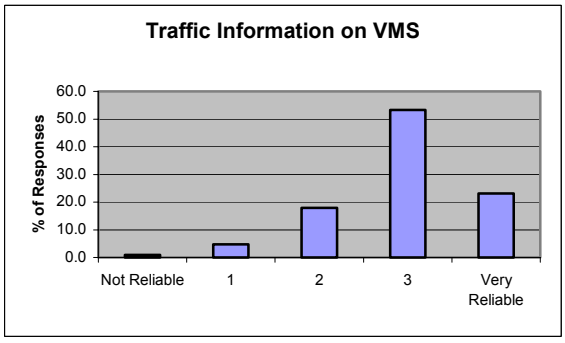
Not reliable	⟷	Very reliable
0	1 2 3	4



Total Response: 211

7. Do you feel that the traffic information provided on variable message signs is **reliable** (please circle a number)?

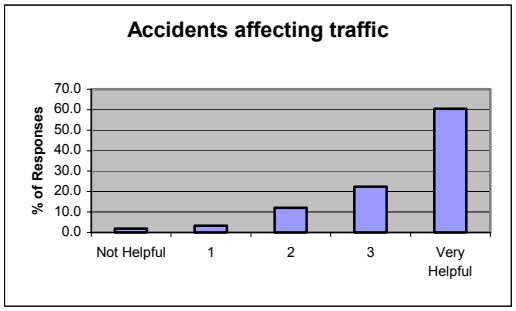
Not reliable	⟷	Very reliable
0	1 2 3	4



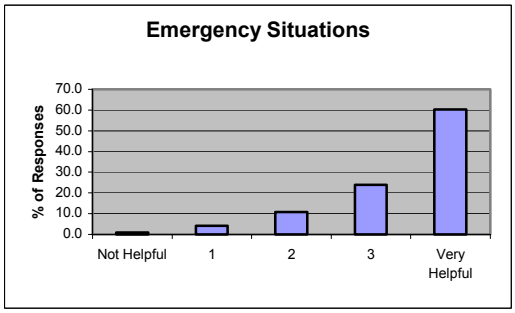
Total Response: 212

8. Please describe how useful the following types of information displayed on Variable Message Signs would be to you by circling the number that represents your feelings for each line:

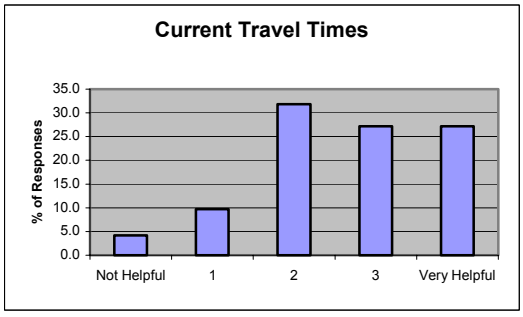
a. Accidents affecting traffic	Not Helpful	0	1	2	3	4	Very Helpful
b. Emergency situations (natural disasters, etc)	Not Helpful	0	1	2	3	4	Very Helpful
c. Current Travel Times	Not Helpful	0	1	2	3	4	Very Helpful
d. Weather Information	Not Helpful	0	1	2	3	4	Very Helpful
e. Traffic Congestion	Not Helpful	0	1	2	3	4	Very Helpful
f. Current Roadwork	Not Helpful	0	1	2	3	4	Very Helpful
g. Future Roadwork	Not Helpful	0	1	2	3	4	Very Helpful
h. Special Event Information (Fairs, Sporting Events)	Not Helpful	0	1	2	3	4	Very Helpful
i. Warnings about Road Hazards	Not Helpful	0	1	2	3	4	Very Helpful
j. Recommended alternate routes (when roads are closed or there is an accident ahead)	Not Helpful	0	1	2	3	4	Very Helpful



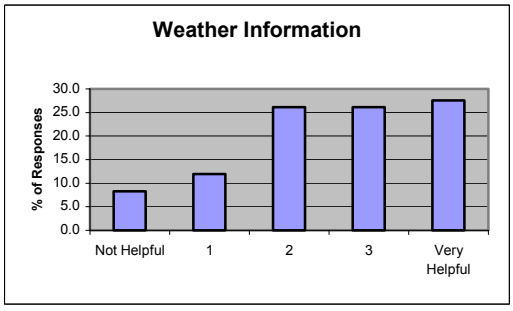
Total Response (a): 215



Total Response (b): 214



Total Response (c): 217



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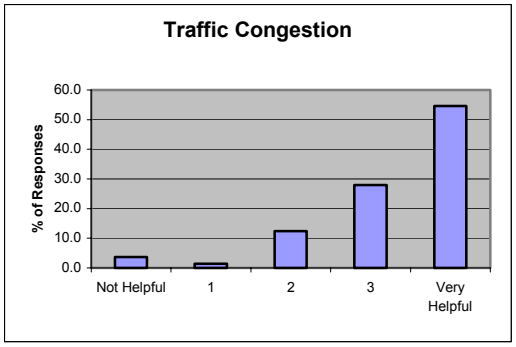
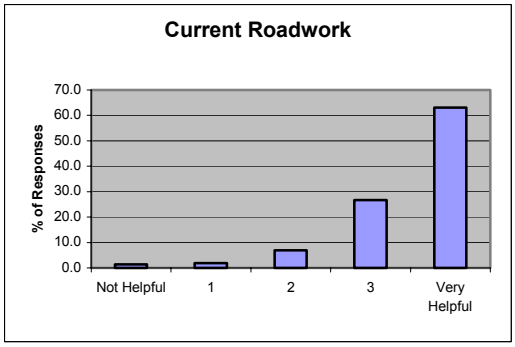


Total Response (e): 218



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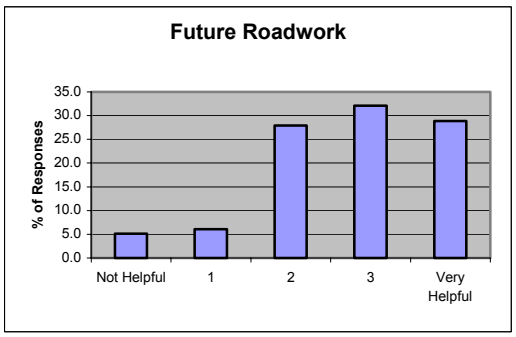
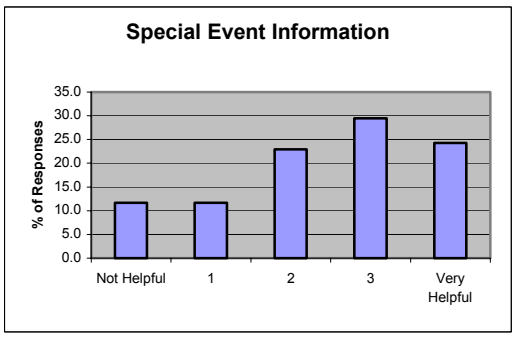


Total Response (g): 215



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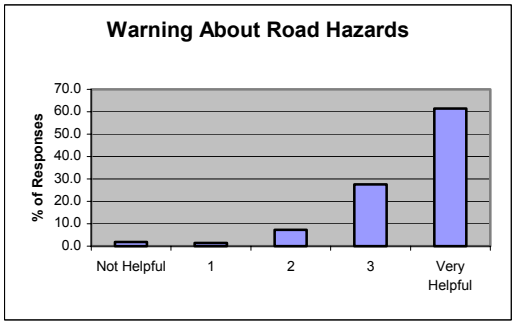
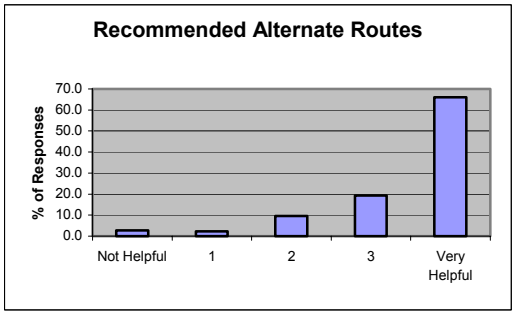


Total Response (i): 218

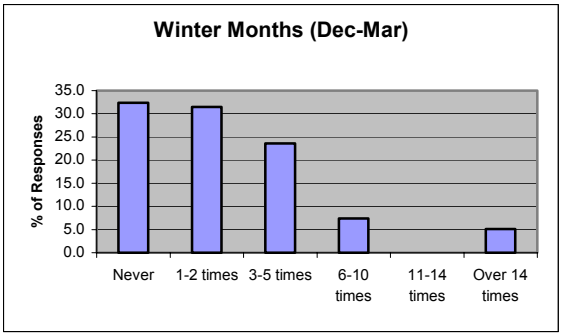


Total Response (j): 218

9. In the past year, on average how often would you estimate that you adjusted your travel route due to traffic or travel time information that was provided on a variable message sign in a month?

During the winter months (December – March):

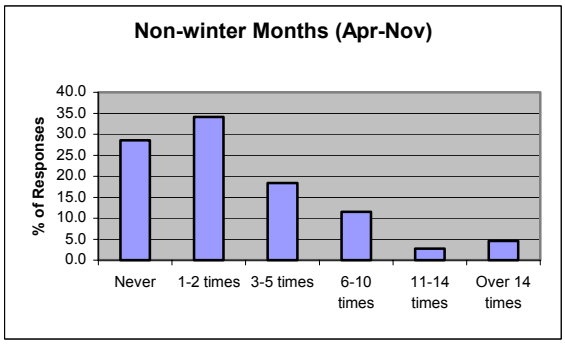
a. Never
b. 1-2 times
c. 3-5 times
d. 6-10 times
e. 11-14
f. Over 14 times



Total Response: 216

During the non-winter months: (April – November):

a. Never
b. 1-2 times
c. 3-5 times
d. 6-10 times
e. 11-14
f. Over 14 times



Total Response: 217

10. If you were driving down the freeway for a 30 minute trip, would you choose to take an alternate route if information on a variable message sign indicated:

a.	A travel time that was *less* than 15 minutes longer than you normally encounter	Yes	No
b.	A travel time that was *more* than 15 minutes longer than you normally encounter	Yes	No
c.	To expect a delay due to a crash ahead	Yes	No
d.	To expect a delay due to road construction ahead	Yes	No
e.	To expect traffic congestion ahead	Yes	No

a. Response Number: 215
Response Rate (%): 97.3

Number Yes: 74
% Yes: 34.4

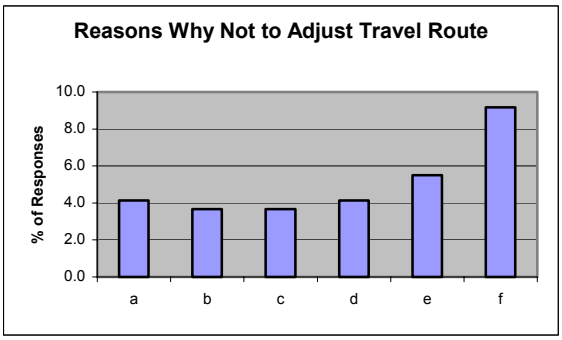
b. Response Number: 215
Response Rate (%): 97.3

Number Yes: 143
% Yes: 66.5

	Number No:	141	
	% No:	65.6	
			Number No: 72
			% No: 33.5
c.	Response Number:	215	
	Response Rate (%):	97.3	
			d. Response Number: 214
			Response Rate (%): 96.8
	Number Yes:	182	
	% Yes:	84.7	
			Number Yes: 162
			% Yes: 75.7
	Number No:	33	
	% No:	**15.3**	
			Number No: 52
			% No: 24.3
e.	Response Number:	215	
	Response Rate (%):	97.3	
	Number Yes:	142	
	% Yes:	66	
	Number No:	73	
	% No:	34	

11. (If you answered "yes" to any part of question #10, please skip to question #12 now). If you answered "no" to all parts of question #10, what are the reasons that you would choose not to adjust your travel route?

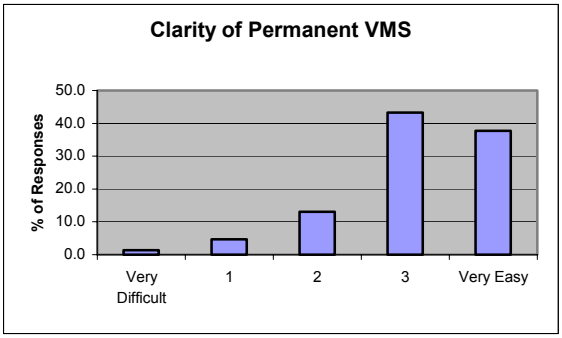
    a. I'm afraid that I will get lost if I deviate from my planned route.
    b. I don't know the alternate routes.
    c. I don't feel safe driving in unfamiliar areas.
    d. I don't trust that the information provided on the signs is accurate.
    e. I think it will be faster to stay on my planned route.
    f. I don't know if the alternate routes would be faster.



Total Responses: 218

12. How easy in general do you feel it is for you to see and read the messages on the permanent variable message signs placed over the freeway or road?

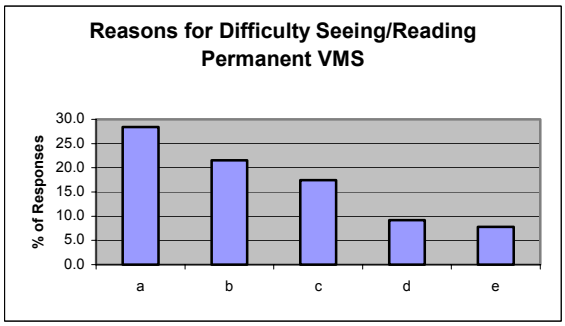
Very Difficult ⟷ Very Easy				
0	1	2	3	4



Total Responses: 218

13. If you have difficulty seeing and reading the messages on the *permanent* variable message signs what in general is the reason for the difficulty?

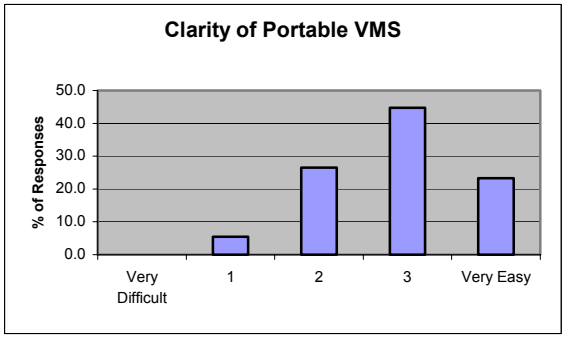
    a. My view of the sign is blocked by traffic.
    b. The messages are too long.
    c. The messages aren't updated frequently enough.
    d. The messages change too frequently.
    e. The lettering on the sign is too small.



Total Responses: 218

14. How easy in general do you feel it is for you to see and read the messages on the portable variable message signs that are placed on trailers along side the freeway or road?

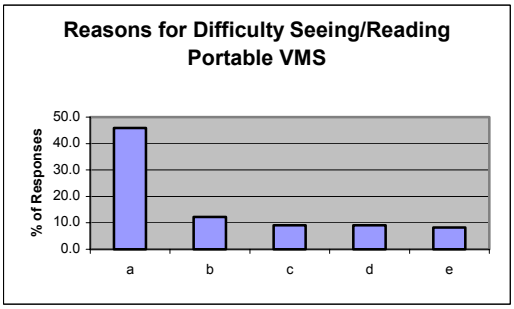
Very Difficult ⟷ Very Easy				
0	1	2	3	4



Total Responses: 219

15. If you have difficulty seeing and reading the messages on the *portable* variable message signs what in general is the reason for the difficulty?

    a. My view of the sign is blocked by traffic.
    b. The messages are too long.
    c. The messages aren't updated frequently enough.
    d. The messages change too frequently.
    e. The lettering on the sign is too small.

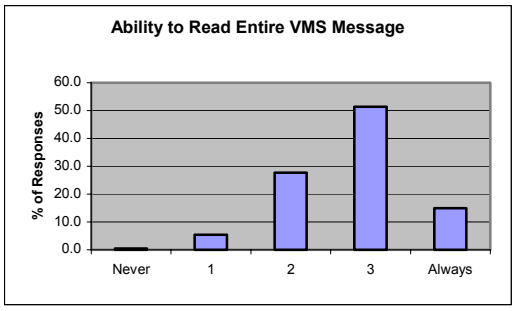


Total Responses: 220

16. How often would you estimate that you are able to read the entire message on the portable and variable message signs while you are driving?

Never ⟷ Always

0 1 2 3 4

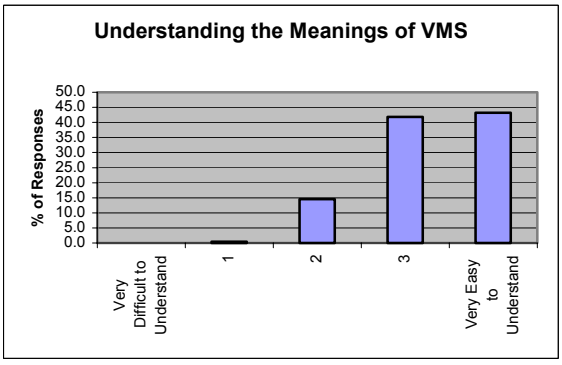


Total Responses: 220

17. In general, how easy to understand do you feel the meanings of the messages on the signs are?

Very Difficult to Understand ⟷ Very Easy to Understand

0 1 2 3 4



Total Responses: 220

Knowledge and Perception of Ramp Meters

(After reading a description)

18. Are there ramp meters on any of the routes you travel most frequently?

    a. No
    b. Yes

Response Number:	220
Response Rate (%):	99.5
Number No:	110
% No:	50
Number Yes:	110
% Yes:	50

If you have answered no to Question 18, skip to Question 23

19. About how long (in minutes) was the last trip you took involving a ramp meter?
    _____ minutes

Response Number:	99		
Response Rate (%):	44.8		
Average (minutes):	25.7	Minimum (minutes):	1
Standard Deviation:	25.1	Maximum (minutes):	180

20. For the trip in Question 19, are you aware of alternate routes that allow you to avoid this particular ramp meter?

    a. No
    b. Yes

Response Number:	104
Response Rate (%):	47.1
Number No:	31
% No:	29.8
Number Yes:	73
% Yes:	70.2

21. Do you have a good idea of how long the trip would take on any of the alternate routes of Question 20?

    a. No
    b. Yes

Response Number:	105
Response Rate (%):	47.5
Number No:	39
% No:	37.1
Number Yes:	66
% Yes:	62.9

22. Would you take one of these alternate routes in Question 20 if:

    a. The ramp was empty of waiting vehicles? Yes No
    b. The ramp was about half full of waiting vehicles? Yes No
    c. The ramp was nearly completely full of waiting vehicles? Yes No
    d. The ramp was overflowing with waiting vehicles? Yes No

a.

Response Number:	104
Response Rate (%):	47.1
Number Yes:	19
% Yes:	18.3
Number No:	85
% No:	81.7

b.

Response Number:	101
Response Rate (%):	45.7
Number Yes:	25
% Yes:	24.8
Number No:	76
% No:	75.2

c.

Response Number:	101
Response Rate (%):	45.7
Number Yes:	63
% Yes:	62.4
Number No:	38
% No:	37.6

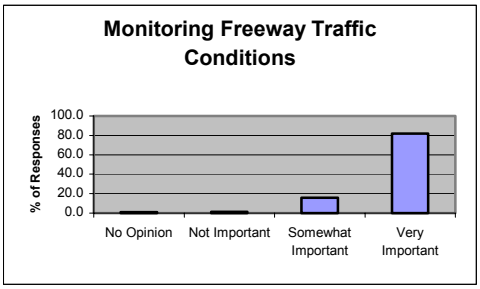
d.

Response Number:	103
Response Rate (%):	46.6
Number Yes:	83
% Yes:	80.6
Number No:	20
% No:	19.4

Perception of Freeway Travel in Wisconsin

23. In your opinion, in larger Wisconsin cities how important is it to monitor freeway traffic conditions, report crashes and other problems to the emergency services, and notify the public about freeway travel conditions such as congestion, icy pavement, and construction delays?

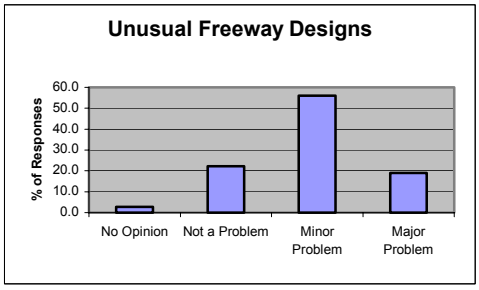
___very important ___somewhat important ___not important ___no opinion



Total Responses: 217

24. In your opinion, how much of a problem are unusual freeway designs, such as left-side entrance ramps, exit-only lanes, etc.

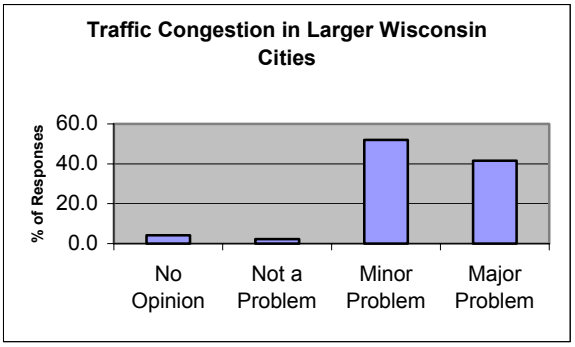
___major problem ___ minor problem ___ not a problem ___ no opinion



Total Responses: 216

25. In your opinion, how serious is the traffic congestion on the freeways in larger Wisconsin cities?

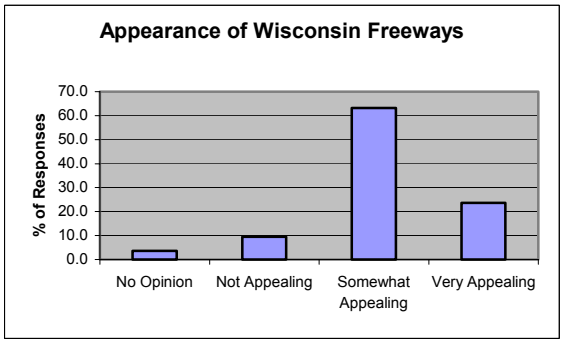
___major problem ___ minor problem ___ not a problem ___ no opinion



Total Responses: 219

26. In your opinion, how pleasant is the appearance of the freeways in Wisconsin?

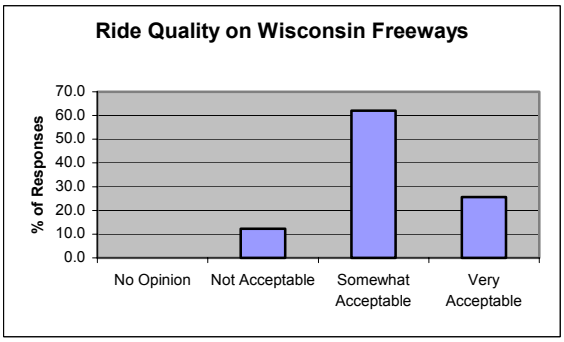
___very appealing ___somewhat appealing ___not appealing ___no opinion



Total Responses: 220

27. In your opinion, how acceptable is the ride quality (pavement condition) of the freeways in Wisconsin?

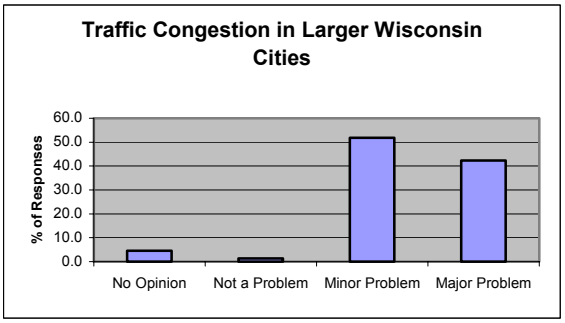
___very acceptable ___somewhat acceptable ___not acceptable ___ no opinion



Total Responses: 219

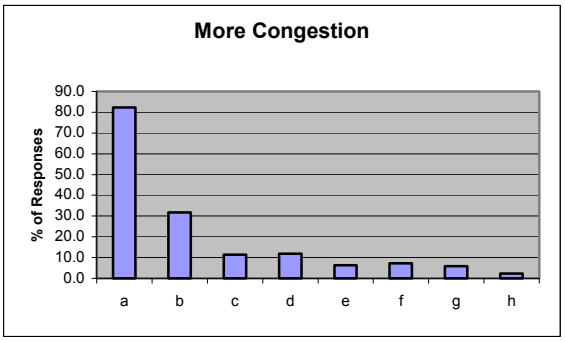
28. In your opinion, how serious is the traffic congestion on the freeways in larger Wisconsin cities?

___major problem ___ minor problem ___ not a problem ___ no opinion



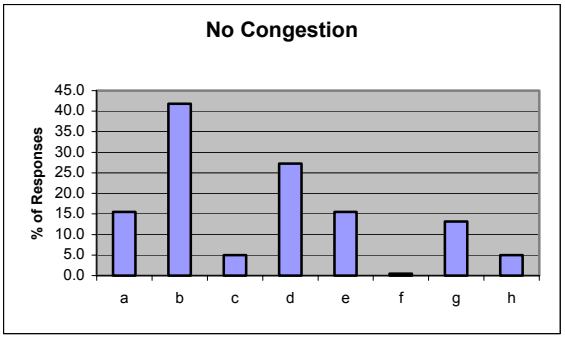
Total Responses: 220

29. If there was a lot more congestion in the area where you live, which, if any, of these do you think you would do? (Please mark all that apply)
    a. Change times of trips (departure times)
    b. Drive less
    c. Use public transportation more
    d. Use car less for recreation/visiting friends
    e. Use car less going to/from work
    f. Move home
    g. Use car less in connection with work
    h. Increase number of cars in household



Total Responses: 220

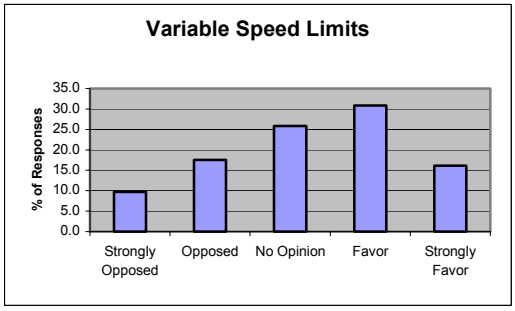
30. If there was no congestion in the area where you live, which, if any, of these do you think you would do? (Please mark all that apply)
    a. Change times of trips (departure times)
    b. Drive more
    c. Use public transportation less
    d. Use car more for recreation/visiting friends
    e. Use car more going to/from work
    f. Move home
    g. Use car more in connection with work
    h. Reduce number of cars in household



Total Responses: 220

31. Some jurisdictions have implemented "variable speed limits" on freeways that are congested during peak hours. For example, if the normal speed limit is 55 mph, it is reduced to 40 or 45 mph when traffic is very heavy. As traffic lightens up, the limit goes back to 55 mph. This technique has been shown to improve traffic flow and safety. How do you feel about this idea?

___Strongly Favor ___Favor ___No Opinion ___Opposed ____Strongly Opposed

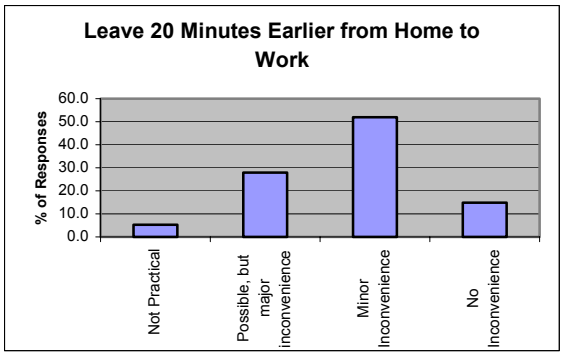


Total Responses: 217

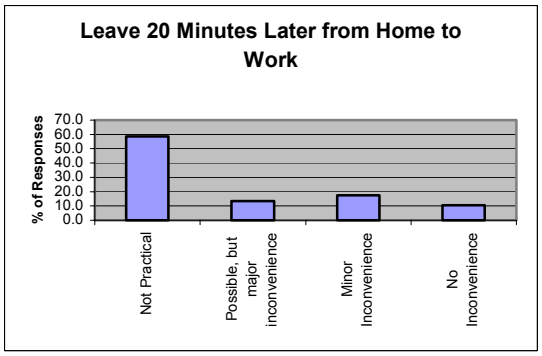
32. If you had to change your departure time because of congestion or construction on your route, how would you be affected for various types of trips:

a. Leave 20 minutes *earlier* for trip from home to work (AM) ___ Not practical ___ Possible, but with major inconvenience ___ Minor inconvenience ___ No inconvenience	b. Leave 20 minutes *later* for trip from home to work (AM) ___ Not practical ___ Possible, but with major inconvenience ___ Minor inconvenience ___ No inconvenience
c. Leave 20 minutes *earlier* for trip from work to home (PM) ___ Not practical ___ Possible, but with major inconvenience	d. Leave 20 minutes *later* for trip from work to home (PM) ___ Not practical ___ Possible, but with major inconvenience

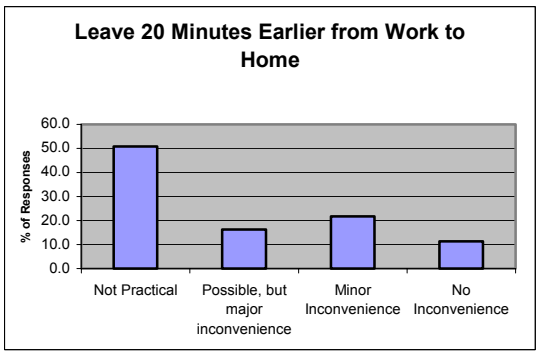
___ Minor inconvenience ___ No inconvenience	___ Minor inconvenience ___ No inconvenience
e. Leave 20 minutes *earlier* for shopping trip ___ Not practical ___ Possible, but with major inconvenience ___ Minor inconvenience ___ No inconvenience	f. Leave 20 minutes *later* for shopping trip ___ Not practical ___ Possible, but with major inconvenience ___ Minor inconvenience ___ No inconvenience
g. Leave 20 minutes *earlier* for recreation/visiting friends ___ Not practical ___ Possible, but with major inconvenience ___ Minor inconvenience ___ No inconvenience	h. Leave 20 minutes *later* for recreation/visiting friends ___ Not practical ___ Possible, but with major inconvenience ___ Minor inconvenience ___ No inconvenience



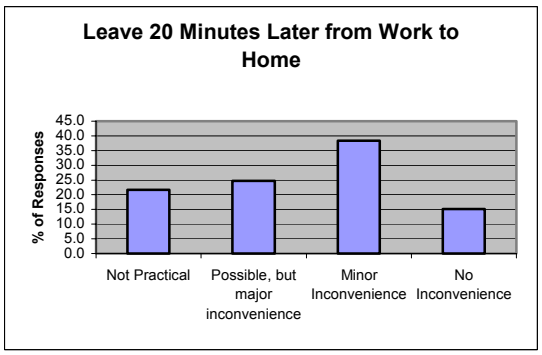
Total Response (a): 208



Total Response (b): 200

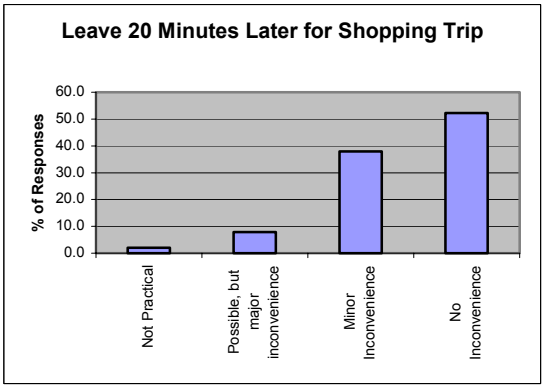


Total Response (c): 203

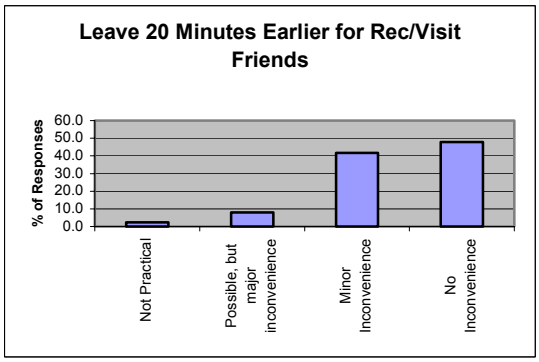


Total Response (d): 198

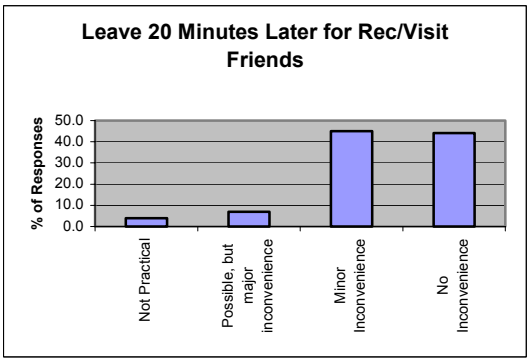
Total Response (e): 211



Total Response (f): 203



Total Response (g): 211

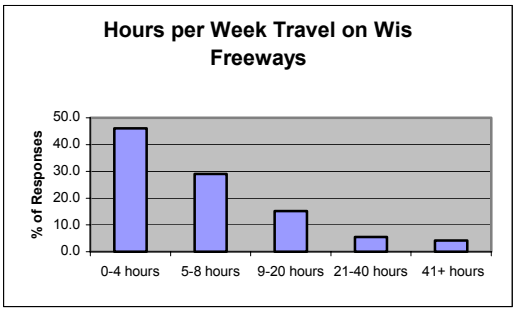


Total Response (h): 202

Demographic Characteristics

33. How many hours per week do you normally travel on freeways in Wisconsin?

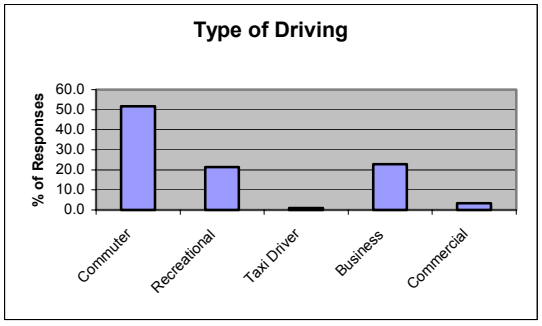
a. 0-4hours
b. 5-8 hours
c. 9-20 hours
d. 11-40 hours
e. 41 + hours



Total Responses: 217

34. In what capacity do you do **most** of your driving?

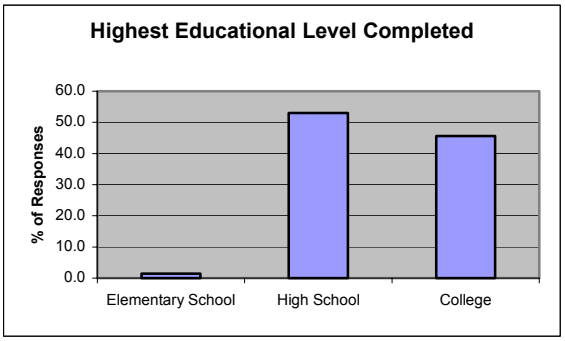
a. Commuter
b. Recreational (vacation)
c. Taxi driver
e. Business
f. Commercial



Total Responses: 211

35. What is the highest educational level you have completed?

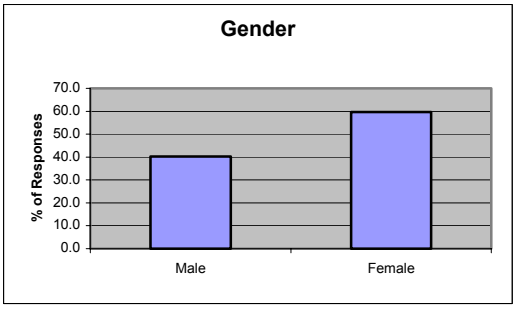
    a. Elementary school
    b. High school
    c. College



Total Responses: 215

36. Are you:

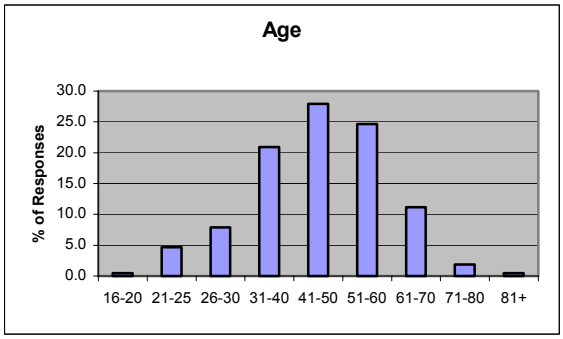
    a. Male
    b. Female



Total Responses: 216

37. What is your age?

a. 16-20
b. 20-25
c. 25-30
d. 30-40
e. 40-50
f. 50-60
g. 60-70
h. 70-80
i. 80+



Total Responses: 215

38. What is the zip code for:
    a. Your Home Address
    b. Your Work Address

39. What other comments do you have about travel on Wisconsin Freeways?

Response Number: 106
Response Rate (%): 48

Comments

With a response rate of 48 percent, there were a lot of general comments as well as specific comments about certain areas of concern on Wisconsin freeways. One major concern for many of the users was that speed limits are not obeyed and stricter laws need to be enforced. Another was that reflective pavement markings are sometimes difficult to see during bad weather conditions. Also, more lanes are expected to be needed and therefore be constructed to accommodate the growing demand of transportation. Listed below are a few specific comments users made.

I feel that the permanent variable message signs should be updated more frequently and should definitely say when the roads or ramps are slippery and icy.
Install signs on ramps for vehicle entering freeways to enter and merge at posted freeway speed.
The biggest hazard is speed. I think the police or state patrol should be stricter when stopping people. Drunk driving fines should be stricter and heavier.
Easy to turn around if necessary, good waysides, pretty forest views, many places to stop for gas, etc, well maintained.
My husband and I have a second home in Northern Wisconsin so we travel the Wisconsin freeways often. We are usually very satisfied with the condition of the roads and when there are conditions such as construction, there are usually enough signs warning us to slow down. The only problems we have are the congestion getting out of and back into Milwaukee and we usually try to work it so that we leave after the rush hour and get back into town before the evening rush hour starts
Metered ramps should be monitored frequently to discern changes in traffic patterns. Metering at peak traffic periods is sometimes not necessary or sometimes very necessary. Sheriff should patrol ramps more frequently for violators.
I think there ought to be a 5minute training film everyday between the news and weather on how to driver, such as, what entrance and exit ramps are designed to do. Like merging at highway speeds and there are many other things that could be retaught to many drivers.
After traveling in Indiana, I like the metered ramps. They really do help with congestion on the interstates.
Alternate routes could be marked better.
Less advertisement signs, Wisconsin is a beautiful state. Let's clean up the signs.
Overall it is great! I love being a resident and love being able to get from here to there with little to no fuss.

(See Appendix III for additional comments)

Conclusions and Recommendations

With the survey results, perceptions on both traditional transportation aspects and ITS related aspects could also be found. Some perceptions regarding the transportation services and drivers' behavioral aspects regarding congestion identified were as follows.

1. **Maintaining ride quality (comfort) and overall pavement condition is the most important aspect of the freeways to be desired.** Prompt emergency responses and reducing traffic congestion are also considered as the most important needs.

2. **Users are willing to change time of trips to avoid or minimize congestion.** The majority of the users surveyed say it would be little or no inconvenience to leave 20 minutes earlier or later for shopping or recreational purposes. However, leaving 20 minutes later from home to work or 20 minutes earlier from work to home would not be practical for the majority. Approximately 82 percent of drivers would change time of trips if there were a lot more congestion in their area. If there were no congestion in the area, 41.8 percent of drivers would drive more. Although 9.7 percent oppose variable speed limits, 47 percent surveyed favor it.

3. **Users feel that speed limits are not obeyed and stricter laws need to be enforced.** As well as more lanes need to be constructed and reflective pavement markings are sometimes difficult to see. Overall, users seem to be satisfied with the Wisconsin freeways, although there is some concern for many urban areas where traffic becomes congested during peak travel times.

In regard to the ITS related perceptions, drivers are quite familiar to both ramp meters and VMS and their attitude to these deployments are not negative. However, more desired features regarding VMS have been identified, including the alternate route information display and the avoidance of the sign blockage.

4. **Variable message signs are useful to report weather and traffic conditions. However, more updated messages would be helpful for the drivers.** Forty percent of Wisconsin drivers are familiar with VMS and 69.6 percent have VMS on their regular travel routes. Users say VMS improves freeway safety, saves driving time and improves travel information. There were mixed feelings on how VMS would reduce the stress caused by driving. The majority of the users said the information on VMS is somewhat reliable. An alternate route would be chosen if the VMS indicated an increase of travel time of more than 15 minutes, a delay due to a crash, construction, or traffic congestion. The major reason why a driver would not adjust their travel route is that they are not sure the alternate route would be faster. A major concern with permanent and portable VMS is that the users' view of the sign is blocked by other traffic.

5. **Ramp meters have been effective in maintaining congestion.** Exactly half (50%) of the users from this survey have ramp meters on the routes they frequently travel on. The average length of a trip involving a ramp meter was approximately 25 minutes. Drivers who are aware of alternate routes that would avoid ramp meters would only use the alternate route if the ramp were completely full or overflowing with waiting vehicles.

Traffic congestion in Madison area is not a great concern so far. However, as the traffic grows along with the growth of the needs of drivers in choosing diverse transportation choices, such as travel departure time choice, destination choice, mode choice and route choice, more travel information could also be supplied.

More specifically, in regard to VMS, in order to fulfill the needs of drivers' needs, identified in the survey result, more diverse traffic information regarding route information should be arranged in the near future. (Whether the alternative route is faster or not.)

To meet such needs, more message contents development are desired. That is, more appropriate message contents for each traffic condition should be prepared, with those in consent to any of the federal standards. This includes, Inter-agency coordination, message deployment, standard message formats, and abbreviations.

Finally, since there has also been an outcry such as "Message is blocked and message is too long.", some kind of uniform field installation guidelines should also be prepared. These include:

- a general Wisconsin VMS installation guidelines
- site selection and roadway factors
    - local installation of permanent VMS
    - VMS visibility
    - VMS technology
- communications and other traffic factors
    - portable VMS placement
    - special considerations

Appendix I

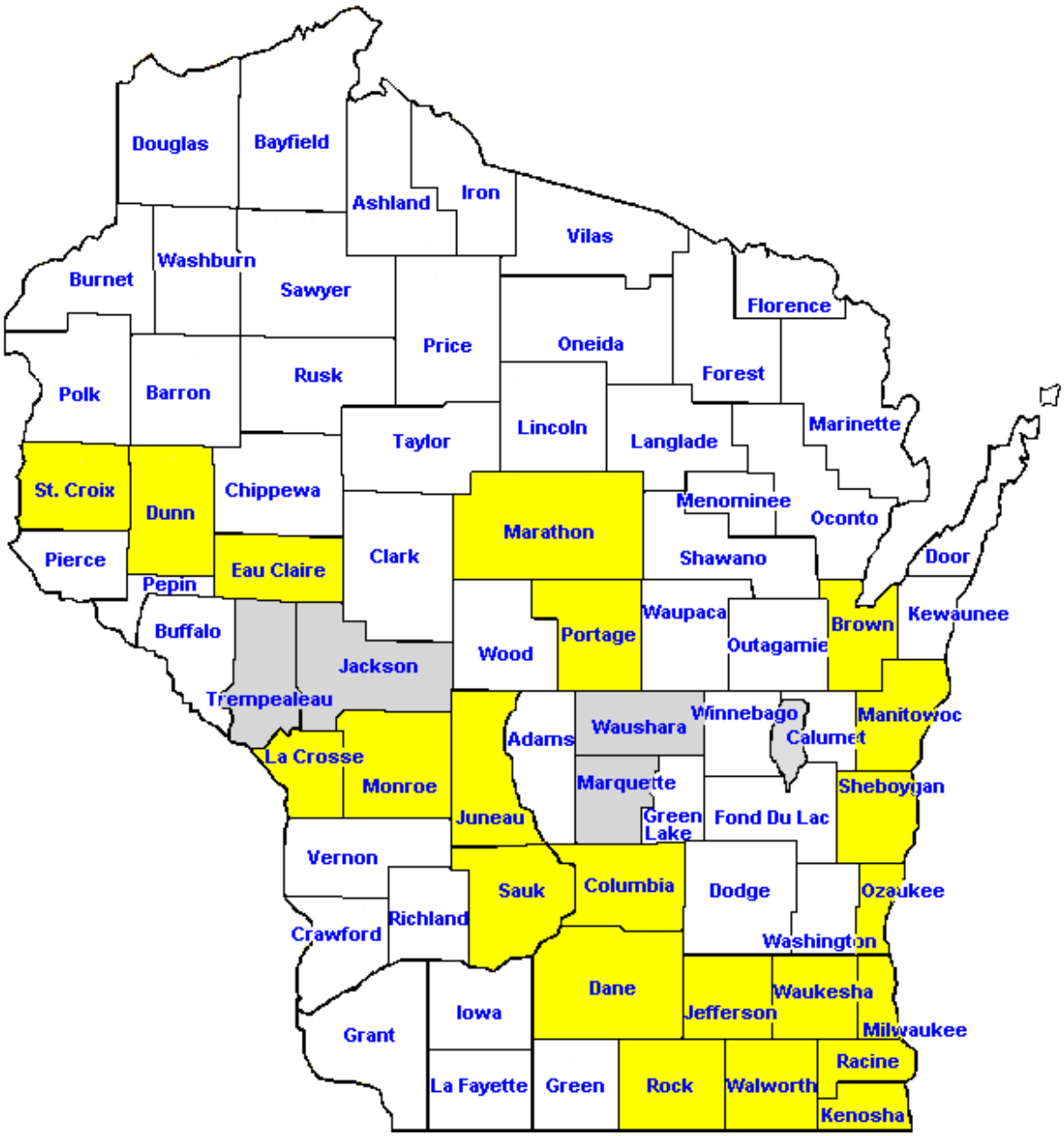
The list below displays the counties included on the survey and the number of samples for each county.

I-39	POPULATION	# USED
ROCK	151290	21
DANE	415810	59
COLUMBIA	50130	7
SAUK	53140	8
~~MARQUETTE~~	13900	
~~WAUSHARA~~	21040	
PORTAGE	67620	10
MARATHON	126850	18
I-94		
MILWAUKEE	956710	135
KENOSHA	142810	20
RACINE	189550	27
WAUKESHA	352650	50
JEFFERSON	74360	10
JUNEAU	23590	4
MONROE	39330	6
~~JACKSON~~	18500	
~~TREMPELEAU~~	26600	
EAU CLAIRE	92360	13
DUNN	38710	6
ST. CROIX	59520	9
I-90		
LA CROSSE	106640	15
I-43		
WALWORTH	86020	12
OZAUKEE	81100	11
SHEBOYGAN	112450	16
MANITOWOC	84890	12
BROWN	222130	31
		500

Appendix II

Counties surveyed:

- **Counties impacted by I-39, I-43, I-90, and I-94**
- **22 counties involved**
- **4 counties excluded due to small sample size (Jackson, Marquette, Trempealeau, and Waushara)**



Appendix III

Additional comments made by surveyors.

- #15 Sign is sometimes not functioning properly – unreadable.
- I live in a small community, so some questions do not pertain to me unless I travel in or to a larger city. Thanks for the stamps, but you do not have to send them.
- It is great.
- Wisconsin landscapes and views are: "Heaven on Earth"
- Speeding is the norm. Getting up to date traffic, construction or accident information to freeway signs seems implausible. Once it's there is it still credible?
- It is very narrow sited to have bus/carpool lane at on ramps (i.e. North Ave on ramp going south on 45 into 894 interchanges. Traffic backs up onto North Ave. Very dangerous from 2-6pm/am. Why not have 2 regular lanes. No one carpools because of these lanes and they are never enforces anyways. Carpool lanes are a real problem in Milwaukee in my opinion.
- Enforce speed limits during rush hour. If the speed limit is 55 it doesn't mean 65 just to be in a traffic jam 5 miles down the road.
- Wisconsin freeways seem in much worse repair than other cold weather states. Signs should stop flashing "United We Stand" and give actual road/traffic information. If updated and current, I would trust the information more.
- Why is Madison so good and Milwaukee so bad?
- VMS signs are more helpful on roads that lead to on ramps than on freeway itself. However, when they give times for multiple routes, they need to scroll a little faster to be able to read multiple options.
- The paint used to mark the lanes can't be seen in the rain. People drive way over the speed limit and no one cares
- Important issues: Quality of roads, variable signs need to be easier to read and kept current, more lanes created, more freeways, particularly Waukesha Country north and south routes.
- The 41 North freeway should have been completed. It would have eased traffic going west. Carpool lanes don't work, there is nobody in them, the other lanes are backed way up, we need to support carpooling, and it would ease congestion in cities.
- Excellent overall.
- Should find a replacement for salt to melt ice and snow.
- Not fair to answer questions, my travel is mainly on 94 West. I'm on Orange Street in Hudson, WI to 35 on to 94 West.
- Even with the speed 55 when congested you go less than 25mph – so it takes longer than street time sometimes. Make more lanes for less congestion. Get the pokey drivers off the freeways.
- Mostly very nice will always need work.
- Clean road kill up. It is sick to drive 45 minutes and see 7 deer on the side of the road. Some of which have orange X's sprayed on them.
- Need more public transportation. Need more telecommuting make carpooling (ride share) easier; more incentives. #10 VMS not only thing that affects decision.
- #13 Semis in front of you and you are behind them.
- The urban freeways are unattractive, rural ones are more pleasant. Major freeway connections (i.e. 43/94) need ramps with 2 lanes, not one.
- St. Croix does an excellent job with snow removal.

- Hat the traffic lights on on-ramp. Love 794, it looks good too!
- In the upper Midwest, Wisconsin roads seem to have more "ruts" where it makes winter driving dangerous. The ruts are from semi-truck traffic.
- #1 Vehicles flip over when they hit a concrete barrier because it has an angle just above the pavement. When a vehicle hits the barrier it's tire rides up that angle; which along with the driver trying to control the vehicle, causes it to roll onto it's roof. As a paramedic I'd have to say that Wisconsin is the capital of rollovers. Get rid of the angles on the barriers. #31 How am I suppose to know which jurisdictions enforce the "variable speed limits?" I would be extremely interested in reviewing the "variable speed limits" study which indicates that this technique improves traffic flow and safety along with who, what, when, where and why of the study. I've found that courteous drivers have a tendency to implement their own "variable speed limits." It's known as "going with the flow!"
- More "slower traffic keep right" signs, more "distance to rest area" signs, reflective lane markings.
- Construction engineering is cheap. Material doesn't wear well, too susceptible to frost/heat heave. No trucks should be allowed in #1 lane on multiple lane freeway (like on East Coast).
- Wisconsin freeways travel is basically pretty good because of road repairs and news updates from news sources such as radio and TV.
- Drivers need to be educated to drive well.
- I feel that the permanent variable message signs should be updated more frequently and should definitely say when the roads or ramps are slippery and icy.
- Overall good. Areas of construction seem to be extended periods of time, too long. Recently accidents on highways have closed them down and traffic on the highway is stuck for hours with no way to get off, go around, or leave.
- Although I enjoy viewing the highways, they have become very congested and when I do have to drive into the larger cities 1-3 times a month, I now take the back roads, especially during the construction season or peak times.
- Your questions are very much repeated.
- Install signs on ramps for vehicle entering freeways to enter and merge at posted freeway speed.
- When an accident occurs on other side of road, need to have someone to keep traffic flowing where the accident did not happen. Everyone wants to look at the accident, slows up things and causes an accident.
- Generally adequate
- #12, 13c Lack of maintenance – burned out bulbs.
- Overall it is pleasurable. I moved here from Illinois and the Chicago suburbs. I hate traffic and congestion, but I rarely have any of these problems in Wisconsin.
- People do not travel at the speed limits (i.e. 10-15 miles over). People do not use directionals when changing lanes, and people tailgate. The poor driving habits of many drivers make freeways increasingly unsafe.
- Milwaukee County freeways are usually well salted etc., but Jefferson County is terrible on winter days. We need more consistency (Milwaukee to Madison).
- I do not use the freeway very often.
- More public transit would be beneficial in the city, and also city-to-city transit.
- We need more driving lanes. Too many cars for the current system.
- I hate multiple ramp exits.
- Update drivers' handbook. There are older people driving like they were taught in 30s and 40s; that the left hand lane is not for 50 mph drivers; what yield signs mean, etc.

- Too much traffic congestion causes me to have anxiety attacks, so I try to stay away from major city traffic everywhere!
- Easy to turn around if necessary, good waysides, pretty forest views, many places to stop for gas, etc, well maintained.
- Just the usual, when construction has to be done if people would just realize it'll take longer, may need more forewarning.
- Speeding is a big safety issue. Large vehicles like SUV's going 80-100mph block view of traffic, cause airflow around cars and endanger drivers. More speed enforcement would save lives.
- All Wisconsin freeways I have traveled have been excellent.
- Can't something be done about traveling the normal speed in a work zone when work is not being done? (i.e. cover up signs, use VMS) P.S. This survey took a lot longer than 10-15min…more like 35 minutes.
- The person that spent our money to put 1/10-mile markers signs on the interstate should be drawn and quartered. 1/2mile…ok; ¼…ok; 1/10…does this person drive?
- Need more control (patrol) for excessive speeding.
- More bathrooms for the disables, hard to get off at places to find one.
- My husband and I have a second home in Northern Wisconsin so we travel the Wisconsin freeways often. We are usually very satisfied with the condition of the roads and when there are conditions such as construction, there are usually enough signs warning us to slow down. The only problems we have are the congestion getting out of and back into Milwaukee and we usually try to work it so that we leave after the rush hour and get back into town before the evening rush hour starts.
- Too many semi-trucks, can't read signs between trucks and speed.
- It is pretty good except for when there is road construction. Especially in winter, it would be great to know how the highways are (slippery, etc).
- It could be worse.
- Southern Wisconsin has very good freeways.
- In general, they are fine; I really don't like unusual (and dangerous) intersections such as on in Madison (South Park & Beltline). I don't like highway going through local towns such as Platteville area.
- Raise speed limit to 65mph on all roads outside major cities. Use less road salt and more sand mixture. Keep memorials along roadside as a reminder to other people who might not know but will when they pass.
- I believe most Wisconsin highways are well maintained.
- City areas (Milwaukee) need redesigning; traffic flow out-dated not monitored enough. Annex area in Milwaukee for traffic to westbound I-94, 3-lane crossover to get west bound. Serious problem
- I'm happy with the freeways.
- Need better paint to mark centerlines and ramps; or paint more often.
- Widened passing lanes are hazardous. They're too short and often as a driver I'm not aware that the extra lane will end abruptly. Sometimes I'm not even aware it is a passing lane at all. Slower traffic and trucks keep to the right.
- Metered ramps should be monitored frequently to discern changes in traffic patterns. Metering at peak traffic periods is sometimes not necessary or sometimes very necessary. Sheriff should patrol ramps more frequently for violators.
- How do you deal with road rage? Are there educational/interface things that are being addresses?
- More lanes, higher speeds, more troopers, truck lanes only

- Better enforcement of driving laws.
- Traffic too congested.
- Keep working on it!
- The biggest hazard is speed. I think the police or state patrol should be stricter when stopping people. Drunk driving fines should be stricter and heavier.
- I think there ought to be a 5minute training film everyday between the news and weather on how to driver, such as, what entrance and exit ramps are designed to do. Like merging at highway speeds and there are many other things that could be retaught to many drivers.
- I think a lot of the interstates and freeways would be much nicer if the aroma of rotting flesh from dead animals was not encountered. In other words, pick up the animal carcasses, not only is this not appealing, but could be considered a safety concern for people as well as other animals that eat the diseased carcass and spread it to other animals who may attack people.
- Remove dead deer more often, nasty sight. Donate meat if possible to food pantries or let drivers take right away without fear of tickets or fines from DNR or DOT; call in at driver convenience to inform either.
- As a whole, highways are in pretty good shape.
- Some areas need to be repaved (41N btw Schoering Rd and 172), Hwy21 and 54 2 lanes between Green Bay heading west (21 to Tomah), 54 to Black River. I travel these and can't believe the traffic and only 2 lanes. I know there are some areas that have 4 lanes but more is needed.
- After traveling in Indiana, I like the metered ramps. They really do help with congestion on the interstates.
- #15 with Portable VMS, maybe an earlier sign should be placed telling of VMS message ahead. This could be a manual sign like "Construction Ahead" sign, etc. #16 Based on looking for signs when at higher speed and/or traffic. #24 Some ramps need more length for acceleration. #27 Based on traveling in many states. #31 One car going slow starts congestion. #33 Use non-freeways whenever possible.
- Merge lanes in many areas inadequate for cars entering freeway.
- If I lived where there was more congestion I would drive less because I'd combine trips. I think the variable speed limits sound hard to enforce and seem open to a lot of tickets that would end up being contested.
- Generally okay
- More emergency phones should be provided.
- Why all the college educated engineers cannot make a bridge and a roadway meet without a great big bump?!
- When you're in a tractor-trailer they have signs at the same height that the driver is and blocks vision of traffic.
- Would like to see more trees planted near freeways so travel wouldn't be so boring on a longer trip, but I like the idea of getting somewhere faster using the freeway.
- #31 I don't think people would slow down unless traffic was so congested that they had to. People just don't follow speed limits like they should.
- Good direction for on and off the ramps.
- Travel congestion, not a big deal in this rural area.
- I get really upset when I am waiting in an on ramp with a metered entrance, and people blow/disregard the red light and go when they wish, also when they use the multi passenger lane with only one person in the vehicle
- Most roads are in good condition.

- (About #8d, h, i) Haven't seen these yet on VMS speed limit going to or from work on freeway is 50 to 55 most of the cars 5 over others 20 to 25 over, changing lanes to avoid cars moving at posted limits, even see sheriff running 20 over.
- #27 my freeway ride is now quite smooth due to recent resurfacing but it was quite rough before.
- Less advertisement signs, Wisconsin is a beautiful state. Let's clean up the signs.
- Most generally I have no problems or complaints about Wisconsin's freeways.
- Overall it is great! I love being a resident and love being able to get from here to there with little to no fuss.
- Alternate routes could be marked better.
- The speed limit is not practical because you need to go almost ten over to keep up with traffic and not have congestion on the freeways.
- I started out as a state trooper; I've retired and do almost no freeway driving. Work part-time in Monona and Madison's east side.
- The congestion is a problem, but also very seasonal. Summers are light, fall is very heavy, and in bad weather traffic is very heavy.
- Wisconsin freeways are much more attractive than many states; let's spend more on ideas like the VMS and make freeways safer. Thank you for sending this, it was interesting.
- Since I live in a rural area and do little travel on the freeway I don't have much input for your study.
- Compared to some states and considering our climate, our roads are good. I would think a major increase of permanent signs would be very costly.
- I think most all travel beyond the speed limit not to consider when you are getting on the freeway.

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